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A Metacognitive Program for Improving the Word Identification and Reading Comprehension Skills of Upper Primary Poor Readers

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G.L Robinson

Paper presented at the AARE Conference, Melbourne, Vic, 29th November to 3rd December, 1999.

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ABSTRACT

This paper reports on a series of three studies designed to assess the effectiveness of a metacognitive approach to teaching word identification and reading comprehension skills to upper primary poor readers, and to investigate effective methods for implementing the metacognitive program in the regular classroom. To improve word identification skills experimental subjects were trained to: Consider the Context; Compare with known words; Carve up the word parts. To help monitor and control the use of these strategies, subjects were taught to: Look for the Cues; Be flexible; Ask: Does it make sense? Reciprocal teaching procedures, incorporating the word identification strategies, were used for comprehension training. Subjects in control conditions received either (a) reciprocal teaching of comprehension skills and traditional methods of word identification, (b) normal classroom reading activities, or (c) normal classroom activities plus phonics-based remedial instruction. Measures of (a) word identification, (b) metacognitive awareness and monitoring of word identification cues, and (c) comprehension were taken on several occasions in each study.

Results of repeated measures analysis of variance showed significant improvements in most measures for all conditions. However, there were significantly greater improvements for subjects in the experimental conditions. Also, a model of implementation in which teachers were entirely responsible for implementation was more effective than one in which the experimenter initially set up the program and the teachers gradually took over responsibility for its implementation.

The implications of these findings for classroom practice are discussed in the light of current research.

INTRODUCTION

Recent Australian surveys suggest that somewhere between 10% and 20% of primary school children have persistent and significant problems in learning to read (House of Representative Standing Committee on Employment, Education and Training, 1992; Waring, Prior, Sanson, & Smart, 1996).

Research indicates that for the majority of poor readers the basic source of their difficulty is failure to develop accurate and efficient (ie, automatic) word recognition skills (Stanovich, 1986, 1992). Poor decoding skills may, in turn, place comprehension processes at risk, due in part to the fact that poor readers devote so much attention to the decoding task that there are not enough cognitive resources left for construction of meaning (Näslund, & Samuels,1992; Stanovich, 1986, 1992). Furthermore, children who fail to develop good word recognition skills in the early grades begin to dislike reading and hence avoid reading wherever possible. This lack of practice could delay the development of vocabulary, syntactic knowledge, and general knowledge that are fostered by good reading. This in turn further inhibits growth in reading (Juel, 1988; Stanovich, 1986, 1992, 1993-1994). In addition, affective and motivational problems resulting from repeated failure experiences can lead to attitudes of "learned helplessness" whereby students give up trying and so perpetuate the failure cycle (Borkowski, Carr, Relinger, & Pressley, 1990; Paris & Winograd, 1990).

Although the consequences of reading failure at the word recognition, comprehension and motivational levels suggest a poor prognosis, especially after a number of years of failure (Juel, 1988; Stanovich, 1986, 1992; Waring et al., 1996), there are also some positive implications for educational practice. This may be

particularly so in the area of metacognitive functioning, ie, in awareness and regulation of appropriate strategies for identifying unfamiliar words (Spedding & Chan, 1993, 1994; Stanovich, 1986). In particular, research by Spedding and Chan (1993, 1994) confirmed that Year 5 poor readers' problems with word identification may reflect deficiencies in the metacognitive abilities that underlie this skill. The particular metacognitive abilities in which poor readers of this age group were found to be inferior were the use of orthographic cues, morphological cues and context cues. Poor readers were less strategic than average readers in using these cues and were often unaware of the strategies they did use. This research suggests that a training program for upper primary poor readers should include metacognitive instruction in the strategic and flexible use of a variety of word identification cues. However, while metacognitive research (both laboratory and classroom-based) has provided valuable insights into effective methods for improving the comprehension of poor readers (eg, Bruce & Chan, 1991; Garner, 1992; O'Shea & O'Shea, 1994; Palincsar & Brown, 1984; Pressley & El-Dinary, 1997), there has been little parallel research into metacognitive approaches to teaching word identification skills (for exceptions see Gaskins, Gaskins, & Gaskins, 1991; Lenz & Hughes, 1990; Thompson & Taymans, 1994).

The general aims of the project reported in this paper, therefore, were two-fold: (i) to investigate the effectiveness of a metacognitive instructional program for improving both the word identification and the comprehension skills of upper primary poor readers; and (ii) to investigate effective methods for implementing the program in the regular classroom.

The specific research questions of this project were:

1. How does the effectiveness of a metacognitive approach to teaching word identification skills compare with the effectiveness of a traditional approach to teaching unfamiliar words (ie, supplying and pronouncing the word), to a group of upper primary poor readers?

2. How does a program involving a metacognitive approach to teaching word identification skills followed by reciprocal teaching of comprehension skills, compare with a program focusing only on reciprocal teaching of comprehension and using the traditional approach to identifying unfamiliar words?

3. To what extent will a metacognitive word identification program improve the metacognitive abilities in word identification and the word recognition skills of a group of upper primary poor readers?

4. What is the best method for training and supporting regular class teachers to implement such a metacognitive training program for poor readers in a regular classroom setting?

METHOD

Subjects

A total of 176 upper primary poor readers was involved in a series of three ongoing studies (32 in Study One, 70 in Study Two and 74 in Study Three). Subjects were selected from the Year 5 and Year 6 classrooms of eight public schools and one private school in a semi-urban area of NSW. The schools were located in areas of mixed middle income and low socioeconomic status. Poor readers were defined as those having a discrepancy of 18 months or more between their chronological ages and the word recognition reading ages on the St Lucia Graded Word Reading Test (Andrews, 1973). Students who met the discrepancy criterion, but who had known intellectual or sensory disability, or whose reading deficit was due to learning English as a second language, were excluded from the subject sample.

Measures

Measures of word identification, metacognitive awareness and monitoring of word identification cues, and comprehension were taken on several occasions in each study. The assessment instruments used are described below.

1. **St Lucia Graded Word Reading Test** (Andrews, 1973) was used to measure accuracy of word identification in each of the three studies. The St Lucia measure was used at the time of the pre-test and at the end of the first training phase for Study One, and on each of the testing occasions for Studies Two and Three.

2. **Metacognitive Abilities in Word Identification** (Spedding & Chan, 1993, 1994), which is an individually administered test designed to assess metacognitive abilities in the knowledge and regulation of phonic, orthographic, morphological and context cues in word identification. During Studies One and Two the metacognitive abilities in word identification measures were taken before intervention began and at the end of the first training phase, while during Study Three the measures were taken on each of the testing occasions. For Studies Two and Three separate analyses were made for the use of metacognitive cues in word identification and for the students' justification for the use of those cues.

3. **The Progressive Achievement Tests (PAT) in Reading Comprehension** (Reid & Elley, 1986) were used to assess competence in reading comprehension for Studies One and Three, while the **Tests of Reading Comprehension (TORCH)** (Mossenson, Hilll, & Masters, 1987) was used for Study Two. In Study One the comprehension measure was taken on two occasions, namely at the time of the pre-test and at the time of the maintenance test. For Studies Two and Three the comprehension measures were used on each of the testing occasions.

The Training Program

The metacognitive instructionai program used in this project was based on reciprocal teaching (Palincsar, 1987; Palincsar & Brown, 1984), which has proved successful in both laboratory and classroom settings for improving the comprehension of students are are adequate decoders but poor comprehenders (see reviews by Moore, 1988, and Rosenshine & Meister, 1994). Reciprocal teaching involves teacher and students taking turns leading a dialogue aimed at revealing meaning of text. During the dialogue the leader (teacher or student) used four comprehension-fostering strategies: (i) *clarifying* any misunderstandings, (ii) *questioning* concerning the gist, (iii) *summarising* the content, and (iv) *predicting* future content. All these activities are embedded in as natural dialogue as possible, with the teacher and students giving feedback to each other.

Prior to reciprocal teaching to improve comprehension skills, subjects in the experimental group were given reciprocal instruction in metacognitive word identification strategies to improve decoding ability. The word identification program was called The Clever Kid's Reading Program, and it trained children in the flexible and strategic use of three word identification strategies (or Clever Kids' Cues) commonly used by competent readers: (i) *Consider the Context* (semantic and syntactic cues), (ii) *Compare with known words or word parts* (phonemic and orthographic cues), and (iii) *Carve up the word parts* (structural and morphological cues). To help students monitor and control their use of those strategies (cues), children were taught to use the Clever Kids' Motto: (i) *Look for the cues*, (2) *Be flexible*, and (iii) *Ask: Does it make sense*?

Instructional materials consisted of a total of 30 short passages (200-400 words in length) written at the Year 4 to Year 5 readability level, and each containing factual material in narrative or descriptive form. Each of the passages was structured to target a particular word identification strategy. For example, some passages contained a number of words with the 'tion' spelling pattern, so that students had to make use of the *Compare with known word* parts strategy. Others contained a number of multisyllabic words which required use of the *Carve up the word parts* strategy. Each of the passages was accompanied by a short answer comprehension test consisting of eight questions. The questions were designed to probe both factual and inferential comprehension of text.

Instruction took place on three 30-minute sessions per week. In general three days (ie, three 30 minute sessions) were spent on each passage. During this time the students were engaged in a number of activities designed to incorporate the targeted words into their automatic sight vocabulary and to build up confidence in their own ability to identify unfamiliar words. First, children were asked to read the title and predict what the passage might be about, thus cuing them into possible vocabulary to look for in the text. Then the experimenter modelled and explained the particular strategy being targeted in the passage, eg, the passage may contain a number of multi-syllable words requiring children to *Carve up the Word Parts*. Next, children were encouraged to take turns in reading orally one paragraph at a time. Every time an unfamiliar word was encountered, the group was encouraged to work collaboratively in using the Clever Kids' Motto and Cues to identify the word, while the experimenter provided guided feedback and coaching as necessary. After this the children played flashcard games with the targeted words and/or listed and discussed other words that could be identified with the targeted strategy. Finally, during the third session children practised reading the passage either individually or in pairs, in preparation for a "one-minute-reading test" in which they endeavoured to see how many words they could read fluently in the given time. For comprehension testing, the subjects wrote short answers from recall to the eight orally presented comprehension questions which accompany each passage. The results of these tests were graphed and shared with the students. Results of both the one-minute reading test, and the comprehension test were graphed and shared with the children each week, thus providing further motivation as they were able to see the improvements which resulted from their efforts and use of the strategies.

Every opportunity was taken to provide attributional training, so as to encourage students to attribute their success (or lack of it), to factors within their control, such as effort and efficient (or inefficient) use of strategies. For example, when students successfully used a strategy for identifying an unfamiliar word, they were encouraged to verbalise which strategy they had used, eg, "I carved up the word parts - pro-tect-ed." Also when students made gains (or maintained their scores) on the weekly tests, they were encouraged to verbalise the fact that they had succeeded because they tried hard and used the Clever Kid's Reading Strategies. If their scores dropped, the reasons were examined, eg, lack of effort or inefficient use of strategies.

Experimental Design

The research consisted of three evolving studies. *Study One,* was designed to answer questions one, two and three of the research questions and involved trialing of the metacognitive word identification and reading comprehension program described above. In this study subjects in the experimental group received the full program of metacognitive word identification strategies and reciprocal teaching of comprehension strategies, while the control subjects received only reciprocal teaching of comprehension strategies along with the traditional approach to teaching unfamiliar words in both training phases. For the purposes of this study the traditional approach consisted of the teacher or another student merely

supplying the unknown word. All training sessions in this study were conducted by the experimenter using small groups of four to eight subjects on a withdrawal basis.

Study Two sought to investigate research question four by examining the effectiveness of one model for facilitating the implementation of the metacognitive word identification and comprehension program by the regular class teachers in the classroom setting. In this study responsibility for instruction first rested with the experimenter who taught in small groups on a withdrawal basis, and then was gradually passed from the experimenter to the class teacher on a team teaching basis, with the teachers finally assuming full responsibility for the program, with periodic visits from the experimenter. In the third, teacher-led phase, all class members (good and poor readers) were included in the training procedures. Although group work was the preferred model during this phase, because of preferred teaching styles and classroom behavioural dynamics, the majority of the teachers chose to implement the program on a whole class basis.

Only the subjects in the experimental group (6 classrooms) participated in the training phases. During these phases the subjects in the control group (5 classrooms) received regular reading instruction from their classroom teachers, and half of them were also withdrawn for special phonics-based remedial reading instruction for 30-45 minutes, three to four days per week.

Study Three sought to examine the effectiveness of a second model for implementing the program into the regular classroom. In this model classroom teachers or resource personnal within the school (teacher's aides or remedial resource teachers) were asked to assume responsibility for instruction from the beginning of the study and to train only the poor readers in metacognitive techniques. Prior to the commencement of the program the teachers (or their assistants) were provided with a detailed teacher's guide and the procedures were explained and modelled for them. They were then asked to implement the program as best suited their regular classroom structure. Regular monitoring by the experimenter was faded as it was ascertained that the teachers or their assistants were following the procedures correctly.

A second purpose of *Study Three* was to examine in more detail the effects of a class teacher implemented program on the answers to research questions one, two and three. Teachers in the experimental group taught both the metacognitive word identification strategies and the reciprocal teaching of comprehension procedures in all phases of the study (as in Study One). Teachers in the control group used reciprocal teaching of comprehension procedures along with the traditional approach to teaching unknown words throughout the study (parallel to Study One). There was also an additional control group in which methods used changed at different phases of the study. Teachers in this group used their normal word identification and comprehension teaching methods in phase one, but changed to reciprocal teaching of comprehension, but not of word identification, for phases two and three.

The third purpose of *Study Three* was to assess a method of creating interest in the metacognitive word identification segment of the program. It had been observed in the previous two studies that many students lost interest after several weeks of metacognitive word identification activities. Instruction in oral reading alone did not seem sufficient to maintain interest and attention for these pupils, and it was not until the reciprocal teaching of comprehension segment was introduced that their interest was reactivated. For this reason it was decided to introduce reciprocal teaching of comprehension skills in a modified form in the first teaching phase along with initial instruction in metacognitive word identification strategies.

RESULTS AND DISCUSSION

Word Identification

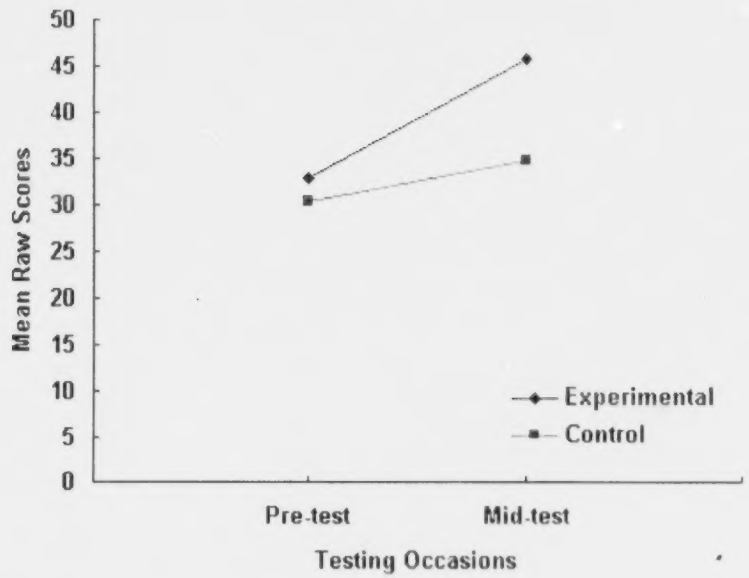
The measures obtained from the different testing occasions were analysed using an Instruction Type x Testing Occasion repeated measure design.

Study One

Results of the analysis for word reading in isolation (St Lucia) revealed a significant occasion main effect, $F(1,30) = 66.28$, $p<.001$. There was also a Group x Testing Occasion interaction, $F(1,30) = 15.97$, $p<.001$. An examination of the graph in Figure 1 showed that the experimental group demonstrated much greater improvement on the St Lucia measure than the control group at the end of the first training phase. The mean raw score for the experimental group improved by almost thirteen points from 32.94 to 45.82 which represents a mean improvement in word recognition reading age of approximately seventeen months. The mean raw score for the control group improved from 30.4 to 34.8 representing a mean improvement in reading age of approximately seven months.

The significant occasion main effect, combined with the fact that the control group made seven months gain in word recognition during the four months, suggests that the daily exposure to word pronunciations and meanings which occurred in the traditional teaching process enabled these students to improve their word recognition performance. However, the significant Group x Occasion interaction clearly demonstrated the greater facilitative effect of the metacognitive word identification intervention strategies for subjects in the experimental group.

Figure 1
Mean raw scores of the experimental and control groups in Study One for the St Lucia Graded Word Reading Test across testing occasions



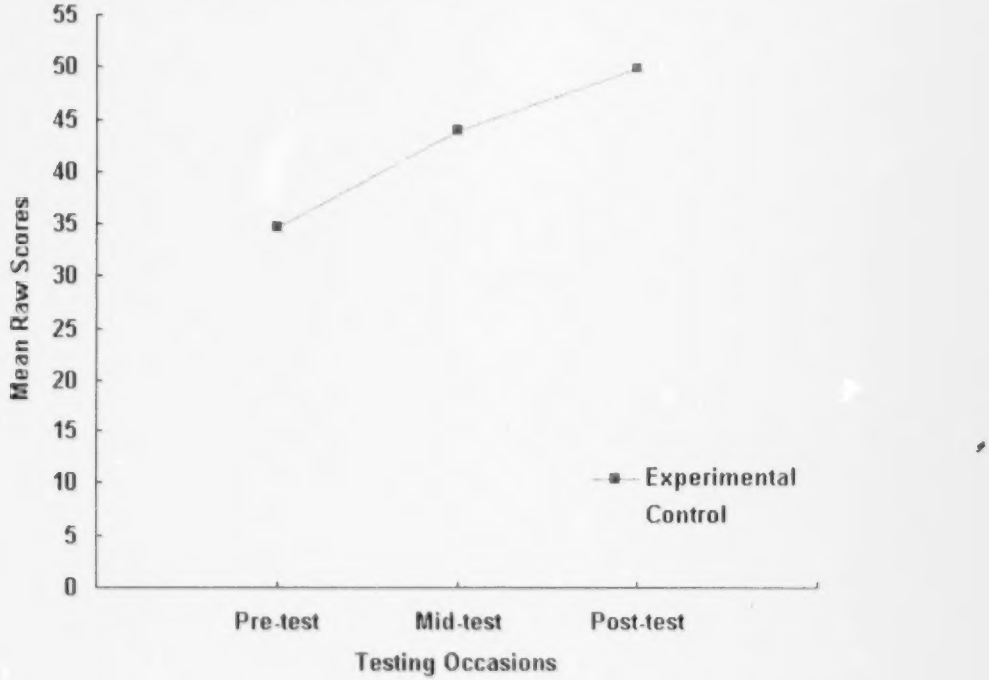
Study Two

Results of the analysis for word reading in isolation (St Lucia) revealed a significant occasion main effect, $F(2,128) = 165.63$, $p<.001$, which indicates that the methods of teaching word recognition to both groups had been effective.

There was also a significant Group x Testing Occasion interaction, $F(2,128) = 14.31$, $p<.001$. Univariate results showed that this interaction occurred in the contrast between the first and second testing occasions, $F(1,64) = 24.34$, $p<.001$. The mean raw scores of the experimental group improved eight points from pre- to mid-test representing a mean improvement in word recognition reading of age of approximately eleven months during the four-month period. During the same time period, the mean raw score of the control group improved about four points, representing a mean improvement in reading age of approximately four months.

During the four months between the mid- and post-testing occasions the experimental subjects maintained the gains achieved at mid-testing, but did not improve at a substantially greater rate than the control group. The slower rate of improvement for the experimental subjects during this phase would tend to confirm the impression gained from the observed class lessons, that class teachers did not appear to implement the metacognitive word identification strategies to any great extent. On the other hand, the phonics based instruction provided for many of the control subjects is likely to have been a factor in their improvement by the time of the final testing occasion, as such instruction is likely to improve the proficiency of word recognition (McCormick & Becker, 1996).

Figure 2
Mean raw scores of the experimental and control groups in Study Two for the St Lucia Graded Word Reading Test across testing occasions

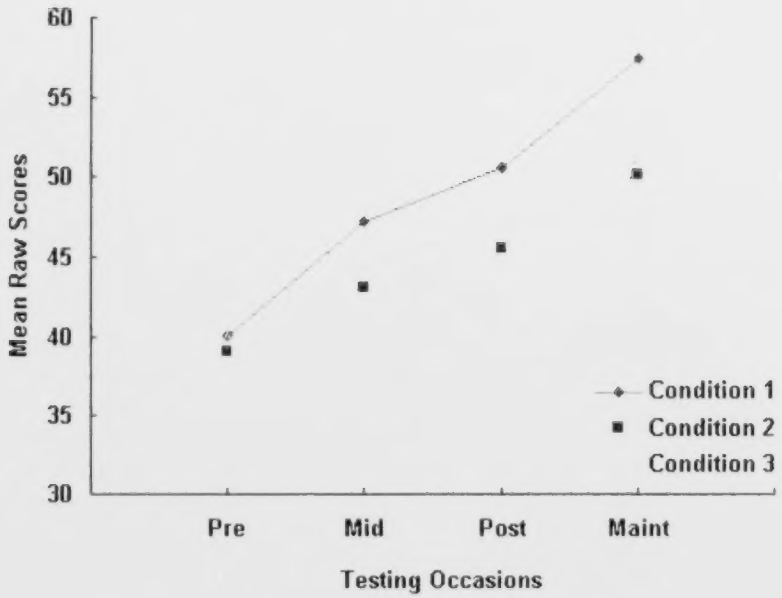


Study Three

Results of the analysis for the St Lucia word reading test showed significant occasion main effects for each of the three experimental conditions, ($F(3,141) = 156.87$, $p<.001$ for Conditions One and Two; $F(3,126) = 143.96$, $p<.001$ for Conditions One and Three; and $F(3,129) = 110.84$, $p<.001$ for Conditions Two and Three). As shown in Figure 3 the mean raw scores of subjects in all conditions improved during the eight months which elapsed between the pre-test and the maintenance test.

There were also significant Group x Testing Occasion interactions which occurred between Condition One and Condition Two, $F(3,141) = 7.31$, $p<.001$; and between Condition One and Condition Three, $F(3,126) = 2.84$, $p<.05$. Univariate results revealed that in both instances these interactions were located in the contrast between the first and second testing occasions, $F(1,47) = 13.93$, $p<.001$; and $F(1,42) = 5.92$, $p<.05$, respectively. As revealed in the graph in Figure 3 the Condition One subjects, who had received the benefits of metacognitive training in word identification strategies from pre- to mid-test, showed greater improvement on mean raw scores during this time period than did the subjects in Condition Two or Condition Three who had received traditional instruction in word identification. In addition, the interaction between Conditions One and Two approached significance in the contrast between mid- and post-test, with subjects in Condition One continuing to show greater improvement than those in Condition Two between the mid- and post-testing occasions (see Figure 3).

Figure 3
Mean raw scores of the three experimental conditions in Study Three for the St Lucia Graded Word Reading Test across testing occasions



The mean raw scores of the Condition One subjects improved approximately seven points from pre- to mid-test representing a mean improvement in word recognition reading age of approximately nine months during the two-month period. During the same time period, the mean raw scores of the subjects in Conditions Two and Three each improved approximately four points, representing a mean improvement in reading age of approximately five months each. The mean rate of improvement for the Condition One

subjects paralleled that of the other two Conditions for the remaining two testing occasions. During the entire intervention, subjects in Condition One showed a mean improvement of approximately 17 points, while subjects in Conditions Two and Three showed mean improvements of approximately 11 and 13 points, respectively. These results represented an improvement in mean word recognition reading age of approximately 22 months, 15 months, and 18 months for Conditions One, Two, and Three, respectively.

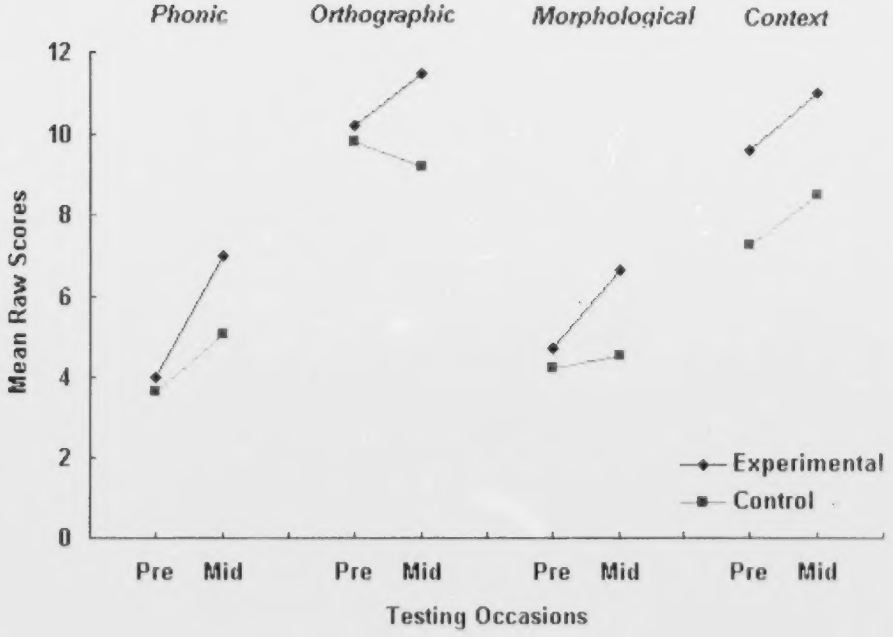
Metacognitive Abilities in Word Identification

Study One

Results of the analysis show significant occasion main effects for all word identification cues except orthographic cues, (phonic cues, $F(1,30) = 14.83$, $p<.001$; morphological cues, $F(1,30) = 9.79$, $p<.01$; and context cues, $F(1,30) = 8.65$, $p<.01$). These results suggest that metacognitive word identification strategies and traditional word recognition techniques were both effective for developing awareness and monitoring of word identification.

There was a significant Group x Occasion interaction for only one of the word identification cues tested, namely that of morphological cues, $F(1,30) = 4.89$, $p<.05$, although the interaction for orthographic cues approached significance. Inspection of the graph in Figure 4 indicates that the experimental subjects had improved their awareness and monitoring of the use of morphological cues and orthographic cues at a greater rate than the control subjects, suggesting a greater facilitative effect for metacognitive word identification training.

Figure 4
Mean raw scores of the experimental and control groups in Study One for Metacognitive Cues in Word Identification across testing occasions



These results seem to indicate that *Carve up the word parts* (morphological cues) and *Compare with known words* (orthographic cues) were the most useful strategies for improving the word identification skills of the subjects in the experimental group. This could reflect the relevance of such skills to word identification requirements for Years 5 and 6. Many of the difficult words encountered at the upper primary level require an awareness of morphology and/or of unique spelling patterns (Spear-Swerling & Sternberg, 1994; Spedding & Chan, 1994). When questioned informally at the end of the intervention, the experimental subjects agreed almost unanimously that *Carve up the word parts* was the most useful strategy they had learned.

The implication seems to be that poor readers at the upper primary level require specific training in the use of morphological and orthographic cues in order to improve their word identification skills, and that metacognitive training is effective in achieving this. The improvement of both groups in the *Consider the Context* strategy may reflect the fact that it is already used by most poor readers (Stanovich, 1984,1986), and as a result of the intervention, both groups may have learned to use this strategy more efficiently, irrespective of the method taught.

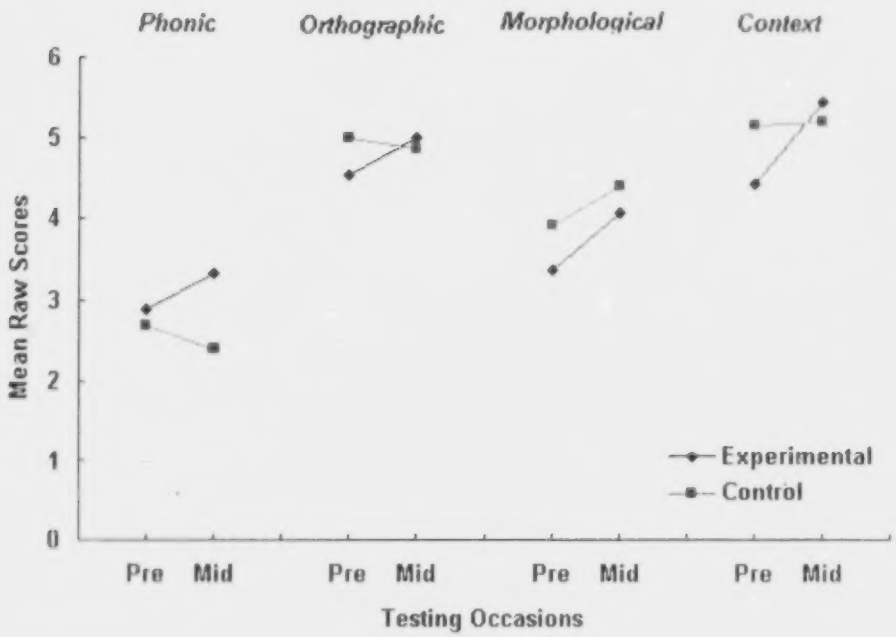
Study Two

Results showed significant occasion main effects and significant Group x Occasion interactions on both the reported use measures and the justification for use of strategies measures.

Significant occasion main effects were found for use of morphological cues, $F(1,64) = 16.94$, $p<.001$, and use of context cues, $F(1,64) = 14.09$, $p<.001$, for identifying unknown words, with both experimental and control subjects making significantly more use of both these cues for word identification by the mid-testing occasion (see Figure 5a). There were also significant Group x Occasion interactions for use of orthographic cues, $F(1,64) = 8.28$, $p<.05$, and the use of context cues, $F(1,64) = 12.05$, $p<.001$. As shown in the graph in Figure 5a, the subjects in the experimental group showed greater improvement on these measures than did the subjects in the control group. (See Figure 5a on following page)

Figure 5a

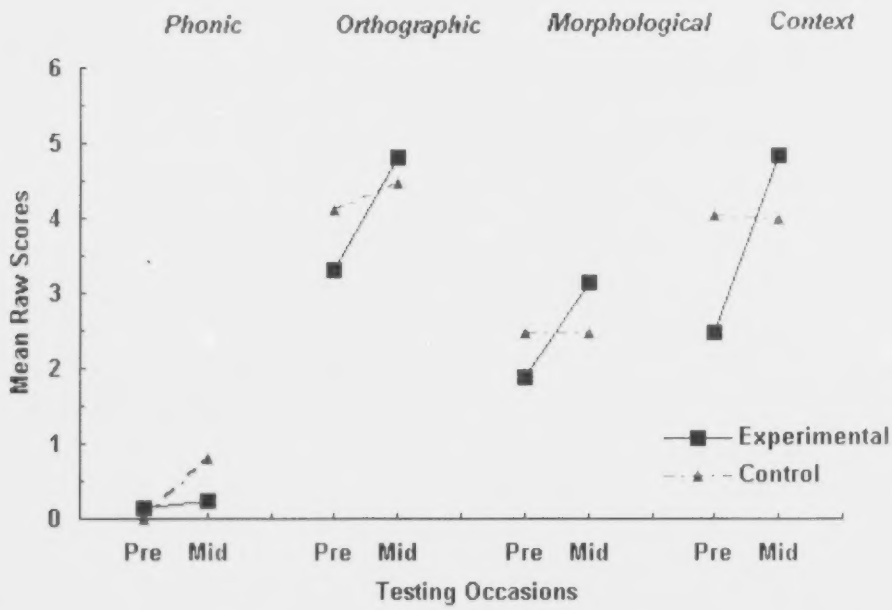
Mean raw scores of the experimental and control groups in Study Two for use of metacognitive cues in word identification



The results for justification of use of cues for word identification were similar to the results for actual use of cues, with significant occasion main effects for orthographic cues, $F(1,64) = 26.93$, $p<.001$; morphological cues, $F(1,64) = 15.07$, $p<.001$; and context cues, $F(1,64) = 35.53$, $p<.001$. Significant Group x Occasion interactions were also found for justification of use of orthographic cues, $F(1,64) = 10.03$, $p<.05$; morphological cues, $F(1,64) = 15.08$, $p<.001$; and context cues, $F(1,64) = 38.04$, $p<.001$. As shown in the graph in Figure 5b the subjects in the experimental group, as a result of the intervention, were far more likely to show metacognitive awareness of their use of orthographic, morphological and context cues in word identification.

Figure 5b

Mean raw scores of the experimental and control groups in Study Two for justification of use of metacognitive cues in word identification



Research indicates that fluency in word recognition skills is facilitated by specific instruction in subword units of English orthography such as onset/rime spelling patterns (eg st/art), syllables, and root words and affixes (eg, Barker, Torgesen, & Wagner, 1992; Goswami, 1994; Henry, 1993; McCormick & Becker, 1996). In particular, it has been suggested that upper primary poor readers (the subjects of this study) benefit from extended instruction in onset/rime analogy strategies (Goswami, 1994), and syllabic and morphological patterns (Henry, 1993). In addition, as upper grade children become more proficient in the use of decoding strategies, they are more likely to use context to monitor comprehension (eg, for self-corrections) rather than as a primary method of word identification (Nicholson, 1991; Pratt, Kemp, & Martin, 1996; Stanovich, 1984, 1986; Yeu & Goetz, 1994).

It would appear that the metacognitive word identification program used in this study facilitated subjects' use of each of these strategies, and also had a particularly important effect on their metacognitive ability to be aware of and justify the use of these strategies. The Clever Kid's Cues, *Compare with known words* and *Carve up the word parts*, were designed to cue the use of both analogy strategies, and syllabic and morphological strategies. The Clever Kid's Motto, *Ask, Does it make sense?* combined with the cue *Consider the Context* was designed to cue subjects to use context as an aid to comprehension. The control subjects also improved significantly, but only in their use of (but not their justification for the use of) morphological strategies. This improvement was possibly because of the phonetic/syllabic remedial instruction received by many of the control subjects, which could have facilitated use of such strategies, but not necessarily made them aware of reasons for using the strategies.

The fact that significant improvement did not occur in the phonic strategy area both for experimental and control groups, has a number of possible explanations. First, the teaching of phonics can be very difficult because of the irregularities between letters and sounds in English, as indicated by the predominance of phonological problems among poor readers (MacDonald & Cornwall, 1995; Snider, 1997; Spear-Swerling & Sternberg, 1994; Stanovich, 1986, 1992; Torgesen, Wagner, & Rashotte, 1994). Second, many students in this study seemed to find this section of the test very difficult and were confused about what was required of them. In addition, phonic rules were not specifically taught in this intervention.

Study Three

There were significant occasion main effects for all but two of the measures, for each of the analyses. The exceptions were for the reported use of orthographic cues for Conditions One and Two and justification for the use of phonic cues for Conditions Two and Three. An examination of the graphs in Figures 6a and 6b, respectively, shows that subjects in each of the Conditions tended to make improved use of phonic, orthographic, and context cues for identifying unknown words and for justifying their use of those cues, with each successive testing occasion. However, results for morphological cues tended to be inconsistent with a falling off in follow-up testing for all conditions. This falling away for all subjects for both the reported use of, and justification for the use of morphological cues, may suggest a need for more intensive instruction in the use of morphological cues (affixes and root words) for identifying unknown words than was provided by the teachers in this study.

While there were significant occasion main effects for nearly all measures, significant Group x Occasion interactions occurred for only two of the measures, both of which concerned the analysis between Conditions One and Three. A significant Group x Occasion interaction occurred between Conditions One and Three for the reported use of phonic cues in the identification of unknown words, $F(3,135) = 2.73$, $p<.05$. Univariate results revealed that this interaction was located in the contrast between the pre- and mid-test, $F(1,45) = 3.50$, $p=.07$. As shown in the graph in Figure 6a, subjects in Condition One showed improved scores for this measure from pre- to mid-test while the subjects in Condition Three had a decrease in scores from pre- to mid-test. There was also a significant Group x Occasion interaction between Conditions One and Three for justification for the use of morphological cues, $F(3,135) = 2.89$, $p<.05$. Univariate results showed that this.

interaction also was located in the contrast between the first and second testing occasions, $F(1,45) = 6.15$, $p<.05$. As shown in the graph in Figure 6b, subjects in Condition One showed improved scores for this measure from pre- to mid-test, while those in Condition Three once again had a decrease in scores from pre- to mid-test. The general lack of significant interaction effects would suggest that teacher implementation of metacognitive word identification strategies was no more effective in developing metacognitive abilities in word identification than traditional methods of word identification.

Figure 6a

Mean raw scores of the three experimental conditions in Study Three for use of metacognitive cues in word identification across testing occasions

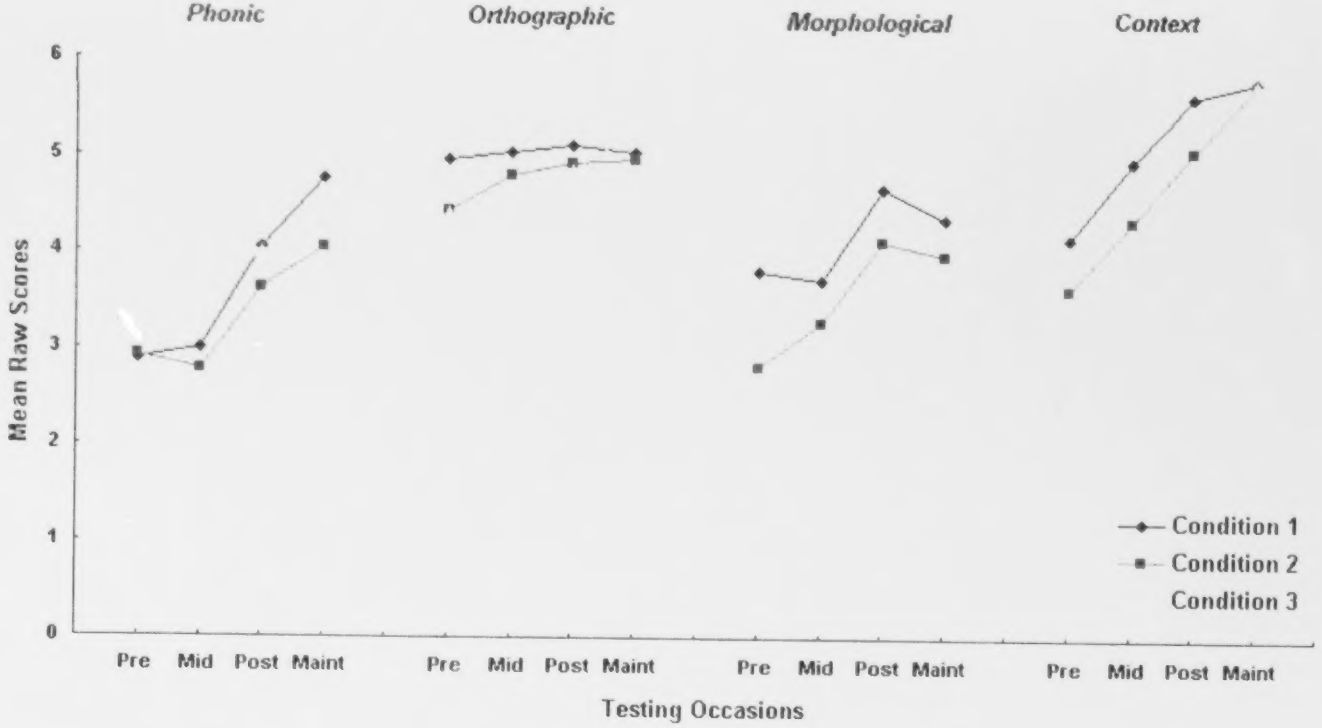


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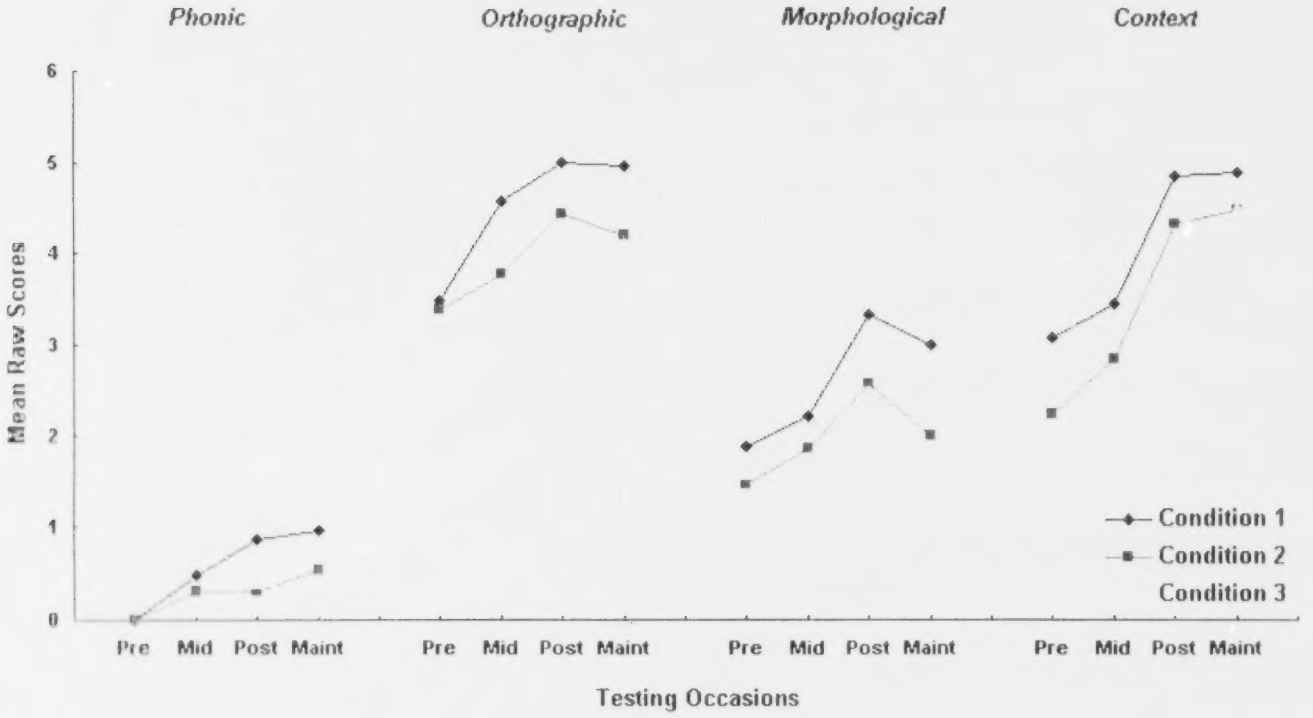
Figure 6b

Mean raw scores of the three experimental conditions in Study Three for justification for the use of metacognitive cues in word identification across testing occasions



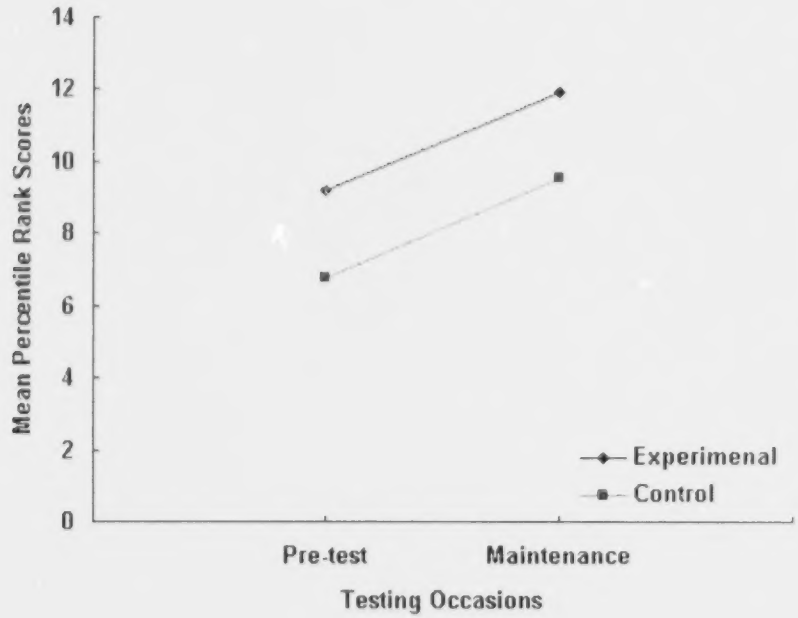
Comprehension

Study One

A significant occasion main effect for the PAT, $F(1,30) = 13.58$, $p<.001$ indicates that both methods of intervention improved reading comprehension. Both groups increased their mean silent reading comprehension raw scores on the PAT by approximately 3 points (see Figure 7), which represents an average improvement in percentile ranking (PR) for the experimental group of approximately 14 points (from PR 19 to 33), and for the control group of approximately 13 points (from PR 10 to 23). The lack of a significant interaction effect, however, suggests that metacognitive teaching of word identification when combined with reciprocal teaching of comprehension skills has no greater effect on comprehension achievement than traditional methods of word identification when combined with reciprocal teaching of comprehension. While the experimental group did not improve at a greater rate than the control group for silent reading comprehension, it must be remembered that they had been given far less training in this skill (due to the fact that they received comprehension training only in phase two of the intervention). The equivalent rate of improvement for both groups (see Figure 7) would thus suggest that the experimental group's metacognitive training in word identification prior to training in comprehension is at least as effective as the control group's two phases of specific training in comprehension skills.

Figure 7

Mean percentile rank scores of the experimental and control groups in Study One for the PAT silent reading comprehension across testing occasions

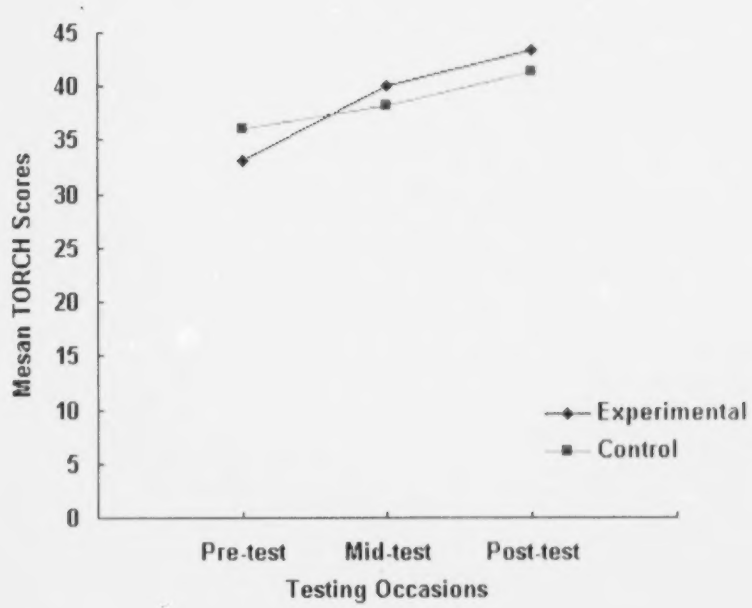


Study Two

Results of the analysis of the TORCH comprehension tests showed a significant occasion main effect, $F(2,126) = 36.37$, $p<.001$, with both groups improving in silent reading comprehension. (See Figure 8) There was also a significant Group x Occasion interaction, $F(2,126) = 4.83$, $p<.01$. Univariate results revealed that this was situated in the contrast between the pre- and mid-testing occasions, $F(1,63) = 9.25$, $p<.01$. As shown in Figure 8 the experimental students had lower mean scores than the control subjects on the pre-testing occasion, but by the time of the mid-test their mean scores were higher than those of the control subjects. These gains were also maintained from mid-test to post-test. The improvement in silent reading comprehension from pre- to mid-test parallels the improvement in word recognition during this same period. This confirms that the metacognitive instruction was more effective than regular class teaching (often supplemented by phonics instruction) when undertaken by the experimenter and assistant. However this metacognitive instruction was no more effective than regular class activities when undertaken by class teachers. The general improvement in comprehension in both groups however, would suggest that as the experimental and control groups became more proficient at word recognition they may be able to devote more of their attentional resources to comprehension of text (Näslund & Samuels, 1992; Spear-Swerling & Sternberg, 1994; Stanovich, 1984, 1986, 1992).

Figure 8

Mean TORCH scores of the experimental and control groups in Study Two for the TORCH silent reading comprehension across testing occasions



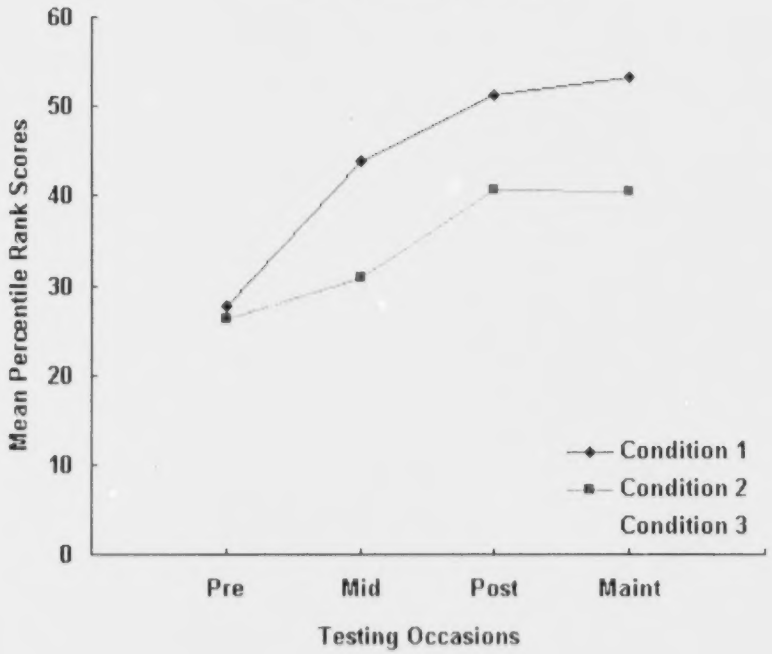
Study Three

Results for the analysis of the percentile rank scores on the PAT tests showed significant occasion main effects for all conditions, ($F(3,147) = 40.54$, $p<.001$ for Conditions One and Two; $F(3,132) = 26.48$, $p<.001$ for Conditions One and Three; $F(3,141) = 14.20$, $p<.001$ for Conditions Two and Three). Univariate results revealed that these significant improvements occurred during the first two training phases for each condition (pre-test to mid-test, and mid-test to post-test), but not during the final training phase (post-test to maintenance test).

There was also one significant Group x Occasion interaction and a second Group x Occasion interaction which approached significance. The significant Group x Occasion interaction occurred between Condition One and Condition Two, $F(3,147) = 3.53$, $p<.05$. Univariate results revealed that the interaction was located between the pre- and mid-testing occasion, $F(1,49) = 9.16$, $p<.01$. As shown in the graph in Figure 9, mean scores of the Condition One subjects increased more rapidly than those of the Condition Two subjects during this time period. The Group x Occasion interaction between Conditions One and Three also approached significance, $F(3,132) = 2.49$, $p<.07$. Once again univariate results suggested a significant interaction between the pre- and mid-testing occasions, $F(1,44) = 6.63$, $p<.05$, with the Condition One subjects showing more rapid improvement in mean scores than those in Condition Three, as indicated in the graph in Figure 9.

Figure 9

Mean percentile rank scores of the three experimental conditions in Study Three for the PAT silent reading comprehension across testing occasions



The mean percentile rank scores of the Condition One subjects improved approximately 16 points from pre- to mid-test. During the same time period, the mean percentile rank scores of the Condition Two subjects improved approximately 5 points, and those of Condition Three subjects improved approximately 9 points. It was during this time period that subjects in Condition One received metacognitive instruction in word identification skills along with a modified form of reciprocal teaching. Subjects in Condition Two at this time received their normal classroom word study and normal comprehension activities, and subjects in Condition Three received training in reciprocal teaching of comprehension strategies along with traditional methods of word identification.

An inspection of the graph in Figure 9 reveals that subjects in Conditions Two and Three made approximately parallel rates of improvement during each phase of the intervention. After the initial significantly greater improvement between the pre- and mid-test, the rate of progress for subjects in Condition One tended to parallel that of the other two Conditions. During the entire intervention period there was an improvement in mean percentile rank scores of approximately 25 points for subjects in Condition One and approximately 14 points each for subjects in Conditions Two and Three. These scores suggest that the modified methods of metacognitive instruction used in this study for word attack and comprehension may give students an initial advantage which is likely to be maintained. It may also suggest that giving teachers full responsibility for the program is an important factor in improved reading comprehension as no significant interaction effects for silent reading comprehension were found when teachers took over responsibility for the program in the final phase of Study Two.

This improvement in reading comprehension scores for Condition One subjects parallels the improvement in word identification scores during the same time period. As suggested previously, it would seem that as Condition One subjects became more proficient at word recognition, they may be able to devote more of their attentional resources to comprehension of text (Näslund & Samuels, 1992; Spear-Swerling & Sternberg, 1994; Stanovich, 1984, 1986, 1992).

It should be noted however, that comprehension scores tended to plateau during the final maintenance phase, which may suggest that poor readers need ongoing, intensive support in reciprocal teaching procedures if they are to maintain significant rates of improvement. It may also suggest that poor readers need ongoing and intensive training in word identification strategies, so that continual significant improvements in word identification may allow for increasing attentional resources to be devoted to the comprehension strategies being targeted in the reciprocal teaching dialogue (Näslund & Samuels, 1992; Spear-Swerling & Sternberg, 1994; Stanovich, 1984, 1986, 1992).

CONCLUSION

Research Questions One ro Three: Effectiveness of the Program

1. It was found that reciprocal teaching procedures for reading comprehension using only traditional methods of word identification as originally developed by Palincsar & Brown (1984), can produce significant gains, not only in comprehension scores but also in word recognition scores of students who are poor readers. This is an interesting finding in view of the fact that there have been questions about the efficacy of reciprocal teaching of comprehension for students who are inadequate decoders (Moore, 1988; Rosenshine & Meister, 1994). It may be that the indirect methods of word study provided in reciprocal teaching procedures are sufficient for promoting significant improvements in word identification skills (McCormick & Becker, 1996), which in turn enables more cognitive resources to be devoted to construction of meaning (Näslund & Samuels, 1992; Spear-Swerling & Sternberg, 1994; Stanovich, 1984, 1986, 1992).

2. It was found that a combination of metacognitive word identification strategies and reciprocal teaching of comprehension was clearly more effective than reciprocal teaching of comprehension with traditional methods of word identification. The former combination was more effective for improving both word identification and comprehension scores, as is shown by signficant interactions in favour of experimental subjects in each of the studies. This is consistent with research evidence regarding the value of metacognitive strategy instruction for improving both word identification and comprehension in poor readers (Gaskins et al., 1991; Lenz & Hughes, 1990; Thompson & Taymans, 1994). Once again a cyclic effect may be involved, with significantly greater improvements in word identification skills resulting from metacognitive strategy instruction, allowing increased attention to be directed to comprehension (Näslund & Samuels, 1992; Spear-Swerling & Sternberg, 1994; Stanovich, 1984, 1986, 1992).

3. Metacognitive instruction in word identification strategies was also found to be more likely than traditional methods of word identification to promote improved metacognitive skills in word identification, although the traditional methods did result in significant improvements. It should also be noted that more significant improvement occurred when instruction in word identification strategies was undertaken by the experimenter (Studies One and Two), than when school-based personnel were responsible (Study Three). There are at least two possible explanations for these results. First, metacognitive abilities in word identification were measured at only the pre- and mid-testing occasions in the first two studies. Further testing at the close of the interventions may have shown less differences between the experimental and control groups in these studies. Second, school-based personnel may not have been as effective at emphasising metacognitive awareness and monitoring of word identification strategies as was the experimenter. This would be consistent with research indicating that many teachers experience difficulty in adopting a more strategic approach to teaching without ongoing collegial coaching and support (Gersten & Brengelman, 1996; Pressley & El-Dinary, 1997).

Research Question Four: Implementation of the Program

It is important that research-based methods are able to be effectively implemented in the regular classroom, and the results of this study provided some positive indications in this regard, as discussed below.

The metacognitive word identification and reciprocal teaching program can be successfully undertaken by school-based personnel (classroom teachers, resource teachers, and teacher's aides), as shown by significant improvements in word identification and comprehension scores for subjects in Condition One during Study Three.

A classroom-based model of implementation appears to be more successful when teachers have responsibility for its implementation from the beginning (Study Three), rather than taking over responsibility after the program has been set up by the experimenter (Study Two). This may have been because teachers who had entire responsibility felt a greater *ownership* of the program, leading to more faithful implementation of each of its components (Coley, DePinto, Craig, & Gardner, 1993; Gersten & Brengelman, 1996).

Pupil interest in the metacognitive word identification strategy instruction appeared to be best maintained when it was combined with some reciprocal teaching from the beginning of instruction. This finding grew out of observations in Studies One and Two that many students lost interest after several weeks of the metacognitive word identification activities, and it was not until reciprocal teaching of comprehension was introduced in the second phase of the studies that their interest was reactivated. When reciprocal teaching of comprehension skills in a modified form was introduced in the first teaching phase of Study Three, along with instruction in metacognitive word identification strategies, interest appeared to be sustained

throughout the intervention. This is consistent with reported evidence of the highly motivational nature of reciprocal teaching procedures (Coley at al., 1993; Palincsar, 1987; Speece, MacDonald, Kilsheimer, & Krist, 1997).

A number of limitations arise from the results of this project which could form the basis for future research.

1. Subject samples were drawn from a limited urban to semi-urban area of the NSW coast. Replication in other areas would help add validity to the results.

2. There was a restriction to the amount of coaching and modelling which the experimenter was able to provide for teachers. Teachers may need a great deal of coaching and support if they are to adopt a style of teaching which promotes metacognitive awareness and monitoring of strategies.

It should be mentioned however, that despite the restricted coaching and modelling time, teachers in Study Three indicated that they were happy with the progress made by their poor readers as a result of the intervention. In response to an informal written questionnaire at the conclusion of the study, they expressed satisfaction with the level of support provided, especially in the Teacher's Guidebook, and indicated they would continue to use the word identification and reciprocal teaching procedures in the future.

Reciprocal teaching of comprehension skills and a metacognitive approach to teaching word identification skills have been identified as effective tools in the search for methods to assist children with reading difficulties. This study has helped verify their value and shown that they can be effectively implemented in regular class situations.

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